The Conductive Thermal Control Material Systems for Space Applications, Phase II

Completed Technology Project (2012 - 2014)

Project Introduction

This Phase II proposal is submitted to further develop and Validate materials and process engineering of the space environment stable, multifunctional conductive thermal control material system (TCMS) that can be applied to space hardware and can enables the hardware to carry higher leakage current through engineering the high electrical conductivity. An innovative space environmental stable TCMS concepts suggested through phase I research & development work for the multifunctional, low (¿S/¿T) material systems that can meet these aggressive goals in cost effective, reliable manner have emerged as validation candidates. The suggested efforts emphasize developments in two material science areas: the first one considers the development of born nitride nano structure that includes nanotubes and nano mesh along with ZnS nano whiskers concept and the second area proposes the synthesis and processing of atmospheric plasma deposition of the various doped ZnO and Zn-Ga-Al-O compounds that are recently identified as the high conductivity compounds. The material system that integrates these two technologies can allow higher leakage currents that may also help to defend against the natural solar storm events. The suggested TCMS have been derived from the available mathematical models for space craft charging that pay attention to the individual charge dissipation mechanisms and the molecular dynamics of the material systems as well as its thermodynamics. Thus the envisioned derived material systems can provide the needed reliable & validated TCMS in typical space environments in (LEO), (GEO) & beyond. The reliability goal for the multifunctional conductive TCMS is to have a design life of > 10 years in LEO and > 15 years in GEO, and we anticipate the phase II developments to mature enough by end of first year to suggest a phase II E program with investments from primes specifically ready for the hardware demonstration.

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Applied Material Systems Engineering, Inc. (AMSENG)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

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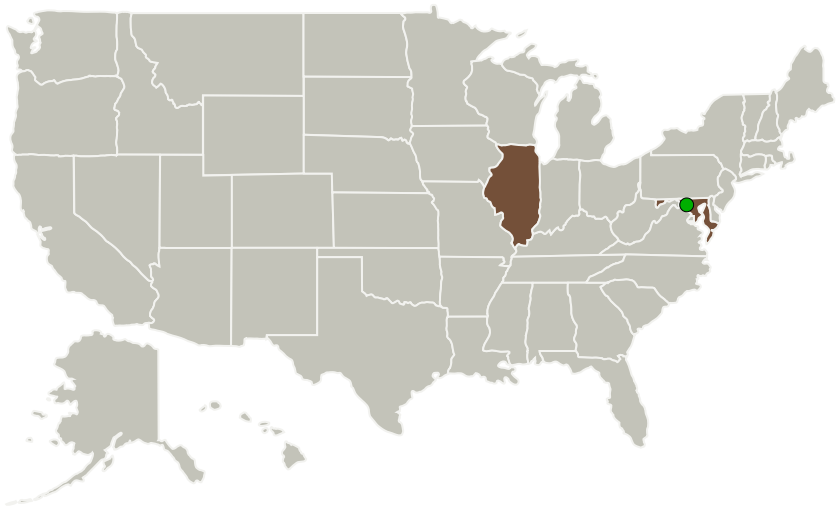
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Applied Material Systems Engineering, Inc. (AMSENG)	Lead Organization	Industry Small Disadvantaged Business (SDB)	Schaumburg, Illinois
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Illinois	Maryland

Project Transitions

May 2012: Project Start

October 2014: Closed out

Project Management *(cont.)*

Program Manager:

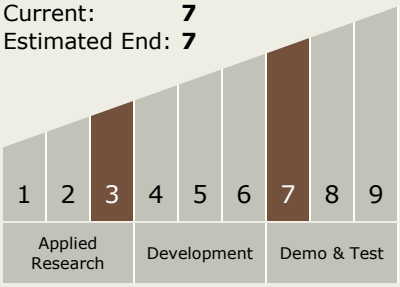
Carlos Torrez

Principal Investigator:

Mukund S Deshpande

Technology Maturity (TRL)

Start: **3**
Current: **7**
Estimated End: **7**



Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.1 Cryogenic Systems
    - TX14.1.1 In-space Propellant Storage & Utilization

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System

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Images

Project Image
The Conductive Thermal Control Material Systems for Space Applications
(https://techport.nasa.gov/image/126336)